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EXAMINER	
FLORES, LEON	
ART UNIT	**PAPER NUMBER**
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/798,946	ZHIDKOV, SERGEY	
	Examiner	Art Unit	
	Leon Flores	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *1-28* is/are allowed.

6)☒ Claim(s) *29-36* is/are rejected.

7)☒ Claim(s) *1-28* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *8/24/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Objections

2. Claims 1-28 are objected to because of the following informalities:

3. In claim 1, page 22, line 21, the limitation "an output error" should be rewritten as "the output error" to avoid confusion.

4. In claim 15, page 27, lines 9-10, the limitation "an output error" should be rewritten as "the output error" to avoid confusion. Appropriate correction is required.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims (30 & 34) are rejected under 35 U.S.C. 102(b) as being anticipated by Raleigh et al (hereinafter Raleigh) (US Patent 6,158,041).

Re claim 30, Raleigh discloses a squared Euclidean distance calculating device for an apparatus for direct measurement of a channel state of a receiver, comprising: a calculating unit which receives a complex signal for a carrier and calculates a squared

value of a signal for I (In-phase) and a squared value of a signal for Q (Quadrature) of the carrier and outputs an error, which is a sum of the squared values, wherein the error is used to improve channel state estimation. (See col. 8, lines 45-58. The squared Euclidean distance between the actual received symbol value and the ideal constellation value. These values are the IQ vectors.)

Claim 34 is a method claim corresponding to system claim 30. Hence, the elements in system claim 30 would have necessitated the steps performed in method claim 34. Therefore, claim 34 has been analyzed and rejected w/r to claim 30 above.

7. Claims (29 & 33) are rejected under 35 U.S.C. 102(b) as being anticipated by Fertner (US Patent 6,185,251 B1).

Re claim 29, Fertner discloses a non-recursive carrier filtering device for an apparatus for direct measurement of a channel state of a receiver, comprising: a delay unit which delays a first error by one or more carriers (One skilled in the art would know that delay elements are inherent features in an equalizer.); and a multiplier unit which multiplies filtering coefficients by a present carrier value and the one or more delayed carrier values and outputs a second error which is a sum of the multiplied values, wherein the second error signal is used to improve channel state estimation. (See col. 15, line 63 – col. 16, line 8. One skilled in the art would know that an equalizer is mainly used to improve, correct, and compensate for channel dispersion.)

Claim 33 is a method claim corresponding to system claim 29. Hence, the elements in system claim 29 would have necessitated the steps performed in method claim 33. Therefore, claim 33 has been analyzed and rejected w/r to claim 29 above.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims (31 & 35) are rejected under 35 U.S.C. 103(a) as being unpatentable over Chiou et al (hereinafter Chiou) (US Publication 2004/0218519 A1) in view of Bohnke et al (hereinafter Bohnke) (US Publication 2002/0060990 A1).

Re claim 31, Chiou discloses an adaptation device for an apparatus for direct measurement of a channel state of a receiver, comprising: an estimating unit which estimates a correlation coefficient signal of two or more adjacent carriers using a signal corresponding to an inverse a squared magnitude of the channel frequency response

(See paragraph 11 & 19. A channel response is calculated from pilot information. One skilled in the art would know that there are pilot sub-carriers and data sub-carriers. Furthermore, one skilled in the art would know that in order to estimate the channel a correlation between adjacent carrier must be done); and a filter coefficient selection unit which outputs filtering coefficients belonging to a filtering coefficient group selected according to the estimated correlation coefficient signal, wherein the filtering coefficients are used to improve channel state estimation.(See paragraph 19. Correction and equalization is performed based on the channel response.)

But the reference of Chiou fails to specifically disclose that the correlation coefficient signal of two or more adjacent carrier using a signal corresponding to an inverse a squared magnitude of the channel frequency response.

However, Bohnke does. (See paragraph 43) Bohnke discloses that the best channel response of each carrier corresponds to the inverse of the squared magnitude of the channel response vector.

Therefore, taking the combined teachings of Chiou and Bohnke as a whole. It would have been obvious to one of ordinary skill in the art to have modified the system of Chiou in the manner as claimed, and as taught by Bohnke, for the benefit of selecting the best channel response for each carrier.

Claim 35 is a method claim corresponding to system claim 31. Hence, the elements in system claim 31 would have necessitated the steps performed in method claim 35. Therefore, claim 35 has been analyzed and rejected w/r to claim 31 above.

10. **Claims (32 & 36) are rejected under 35 U.S.C. 103(a) as being unpatentable over Chiou et al (hereinafter Chiou) (US Publication 2004/0218519 A1), in view of Fertner (US Patent 6,185,251 B1), and further in view of Raleigh et al (hereinafter Raleigh) (US Patent 6,158,041).**

Re claim 32, Chiou discloses an apparatus for direct measurement of a channel state of a receiver, comprising: an adaptation device including an estimating unit which estimates a correlation coefficient signal of two or more adjacent carriers using a signal corresponding to an inverse a squared magnitude of the channel frequency response (See paragraph 11 & 19. A channel response is calculated from pilot information. One skilled in the art would know that there are pilot sub-carriers and data sub-carriers. Furthermore, one skilled in the art would know that in order to estimate the channel a correlation between adjacent carrier must be done) and a filter coefficient selection unit which outputs filtering coefficients belonging to a filtering coefficient group selected according to the estimated correlation coefficient signal. (See paragraph 19. Correction and equalization is performed based on the channel response.)

But the reference of Chiou fails to specifically disclose that the correlation coefficient signal of two or more adjacent carrier using a signal corresponding to an inverse a squared magnitude of the channel frequency response.

However, Bohnke does. (See paragraph 43) Bohnke discloses that the best channel response of each carrier corresponds to the inverse of the squared magnitude of the channel response vector.

Therefore, taking the combined teachings of Chiou and Bohnke as a whole. It would have been obvious to one of ordinary skill in the art to have modified the system of Chiou in the manner as claimed, and as taught by Bohnke, for the benefit of selecting the best channel response for each carrier.

The combination of Chiou and Bohnke disclose the limitations, as claimed above, except they fail to specifically disclose a squared Euclidean distance calculating device including a calculating unit which receives a complex signal for a carrier and calculates a squared value of a signal for I (In-phase) and a squared value of a signal for Q (Quadrature) of the carrier and outputs a first error, which is a sum of the squared values.

However, Raleigh does. (See col. 8, lines 45-58) Raleigh discloses a system that computes the squared Euclidean distance between the actual received symbol value and the ideal constellation value, and these values correspond to the IQ vectors.

Therefore, taking the combined teachings of Chiou, Bohnke, and Raleigh as a whole. It would have been obvious to one of ordinary skill in the art to have modified the system of Chiou in the manner as claimed, and as modified by Bohnke and as taught by Raleigh, for the benefit of estimating the channel state information.

The combination of Chiou, Bohnke, and Raleigh disclose the limitations, as claimed above, except they fail to specifically disclose a non-recursive carrier filtering device including a delay unit which delays the first error by one or more carriers and a multiplier unit which multiplies the filtering coefficients by a present carrier value and the one or more delayed carrier values and outputs a second error which is a sum of the

multiplied values, wherein the second error signal is used to improve channel state estimation.

However, Fertner does. (See col. 15, line 63 – col. 16, line 8.) Fertner discloses an optimal procedure for determining in the time domain equalizer coefficients for an equalizer, where the equalizer compensates for the effects of the communications channel on the transmitted signal.

Therefore, taking the combined teachings of Chiou, Bohnke, Raleigh, and Fertner as a whole. It would have been obvious to one of ordinary skill in the art to have modified the system of Chiou in the manner as claimed, and as modified by Bohnke and Raleigh and as taught by Raleigh, for the benefit of minimizing means square error. (See col. 16, lines 1-2)

Claim 36 is a method claim corresponding to system claim 32. Hence, the elements in system claim 32 would have necessitated the steps performed in method claim 36. Therefore, claim 36 has been analyzed and rejected w/r to claim 32 above.

Allowable Subject Matter

11. Claims 1-28 are allowed.

12. The following is an examiner's statement of reasons for allowance: Typically, prior art system/method performs channel state information "CSI" estimation as shown in US Publication 2002/0186797 A1 (hereinafter prior art). In contrast, the current invention illustrates a new structure, not taught in the prior art, which also estimates the

channel state information. Therefore, the art of record does not suggest the respective claim combinations together and nor would the respective claim combinations be obvious with:

13. Re claim 1, the further limitation of, "An apparatus for direct measurement of the channel state of an OFDM (Orthogonal Frequency Division Multiplexing) receiver comprising: a de-mapping and pilot insertion unit which receives complex OFDM signals, performs de-mapping processing corresponding to data carriers, TPSC (Transmission Parameter Signaling Carriers) and one of CPC (Continual Pilot Carrier) and SPC (Scattered Pilot Carrier) of the complex OFDM signals, and outputs the de-mapped signals; a subtraction unit which subtracts the complex OFDM signals from the de-mapped signals and outputs the subtracted values; a squared Euclidean distance calculation unit which calculates a squared value of a signal for I (In-phase) and a squared value of a signal for Q (Quadrature) of output signals of the subtraction unit, and outputs a first error which is a sum of the squared values; a non-recursive carrier filtering unit which delays the first error one carrier at a time, multiplies filtering coefficients by a present carrier value of the first error and multiple delayed carrier values, and outputs a second error which is a sum of the multiplied values; a data carrier extraction unit which extracts and outputs an error corresponding to the data carrier from the second error; a recursive symbol filtering unit which outputs a third error which averages an output error of the data carrier extraction unit and a previous symbol; and a quantization unit which receives the third error, inverts the third error with non-

linear transfer function relation, and outputs a CSI (Channel State Information) signal including quantized multiple bits". Claims 2-14 depend on claim 1.

14. Re claim 15, the further limitation of "A method of directly measuring the channel state of an OFDM receiver comprising: receiving complex OFDM signals, performing de-mapping corresponding to respective values belonging to data carriers, TPSC, and CPC or SPC of the complex OFDM signals, and outputting the de-mapped signals; subtracting the complex OFDM signals from the de-mapped signals, and outputting the subtracted values; calculating a squared Euclidean distance by calculating a squared value of a signal for I and a squared value of a signal for Q of output signals of the subtracting, and outputting a first error which is a sum of the squared values; filtering a non-recursive carrier by delaying the first error one carrier at a time, multiplying filtering coefficients by a present carrier value of the first error and multiple delayed carrier values, and outputting a second error which is a sum of the multiplied values; extracting a data carrier by extracting and outputting an error corresponding to the data carrier from the second error; filtering a recursive symbol by outputting a third error averaging an output error of the data carrier extracting step and a previous symbol; and quantizing by receiving the third error, inverting the third error with a non-linear transfer function relation, and outputting a CSI signal including quantized multiple bits". Claims 16-28 depend on claim 15.

15. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably

accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Robinson (US 2002/0186797 A1) discloses an apparatus/method for determining channel state information from many carriers.
- Weon-cheol Lee et al "Performance Analysis of Viterbi Decoder Using Channel State Information in COFDM System", IEEE Transactions On Broadcasting, Vol., 44, No. 4, December 1998.

Contact

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Leon Flores whose telephone number is 571-270-1201. The examiner can normally be reached on Mon-Fri 7-5pm Alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Payne can be reached on 571-272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

LF
April 4, 2007

DAVID C. PAYNE
SUPERVISORY PATENT EXAMINER